DEPARTMENT OF THE ARMY
ASSISTANT CHIEF OF STAFF FOR INSTALLATION MANAGEMENT
600 ARMY PENTAGON
WASHINGTON, DC 20310-0600

REPLY TO
ATTENTION OF

Army Reserve Division

Andrew Jankowski, Project Manager
Illinois Environmental Protection Agency
1021 North Grand Avenue East
P.O. Box 19276
Springfield, IL 62794-9276

MAR 17 2004

Dear Mr. Jankowski:

This correspondence provides responses to additional comments on the Draft Construction Completion Report, Various Site Remediations for the Fort Dearborn United States Army Reserve Center. Comments were provided by Illinois Environmental Protection Agency letter of November 26, 2003. A similar response letter has also been provided to the United States Environmental Protection Agency Region 5 Federal Facilities Response Section office.

Please feel free to call Douglas Meadors of the United States Army Engineer District, Louisville at (502) 315-6345 with any technical questions regarding the enclosed documents.

You may respond to MAJ David Quivey, Chief, Military Construction Division by e-mail at david.quivey@ocar.army.pentagon.mil, by mail to the address provided in this correspondence or by telephone at (703) 601-3406.

Sincerely,

Del C. Fougner

Del C. Fougner
Colonel, US Army
Director, Army Reserve Division

Enclosure

DEPARTMENT OF THE ARMY
ASSISTANT CHIEF OF STAFF FOR INSTALLATION MANAGEMENT
600 ARMY PENTAGON
WASHINGTON, DC 20310-0600

REPLY TO
ATTENTION OF

Army Reserve Division

Karen Mason-Smith, Remedial Project Manager
Environmental Protection Agency
Region 5
SR-6J
77 West Jackson Boulevard
Chicago, IL 60604-3590

MAR 1 7 2004

Dear Ms. Mason-Smith:

This correspondence provides responses to additional Illinois Environmental Protection Agency comments on the Draft Construction Completion Report, Various Site Remediations for the Fort Dearborn United States Army Reserve Center. Comments were provided by an Illinois Environment Protection Agency letter of November 26, 2003. A similar response letter has also been provided to the Illinois Environmental Protection Agency Federal Facility Unit.

Please feel free to call Douglas Meadors of the United States Army Engineer District, Louisville at (502) 315-6345 if you have any technical questions.

You may respond to MAJ David Quivey, Chief, Military Construction Division, by e-mail at david.quivey@ocar.army.pentagon.mil, by mail to the address provided in this correspondence or by telephone at (703) 601-3406.

Sincerely,

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Enclosure

1. **IEPA Comment #5**. The Polynuclear Aromatic Hydrocarbon Background Study, City of Chicago, Illinois February 24, 2003 the Army cites in their response is just that, a study. The study does indeed target the Chicago urban area, and the area around the site is part of that urban area. However, the study is at present, not part of any published regulations. Therefore, the Agency is precluded from utilizing them as such, as the Army appears to imply. As a result, the 167 parts per billion (ppb) benzo(a)pyrene concentration which exceeded the residential remedial objective of 90 ppb is still a concern. The Army is going to have to make a determination as to how to address this, either through additional soil removal, or to revise the land use of the property to be restricted to industrial and/or commercial.

   Response: It is the Army's position that the property is suitable for future unrestricted land use and no further actions are required at the site. Since receipt of the IEPA comment expressing concern about the 167 μg/kg benzo(a)pyrene concentration, a Tier 3 Human Health Risk Assessment calculation was completed to address the this exceedance of the Tiered Approach to Corrective Action Objectives (TACO) Tier I Remediation Objective (RO). The risk calculation was completed consistent with TACO (35 Illinois Administrative Code Part 742) requirements and USEPA's (1989) *Risk Assessment Guidance for Superfund (RAGS): Volume I: Human Health Evaluation Manual (Part A)*. The detailed risk assessment procedure and calculations are included as Attachment A of this response.

   Results indicate the carcinogenic risk for an adult resident due to exposure to PAHs, including benz(a)pyrene, in site soil is estimated to be 2×10^{-7}, while the cancer risk for a child resident was calculated as 8×10^{-7}. According to the National Oil and Hazardous Substance Pollution Contingency Plan (NCP), potentially acceptable risk levels span the range of one in a million (1×10^{-6}) to one in ten thousand (1×10^{-4}). Cancer risks less than 1×10^{-6} are considered *de minimis* risks and do not require further attention. The NCP considers 1×10^{-6} as the point of departure in establishing the acceptable level of risk for a site. The estimated carcinogenic risks for adult and child residents due to PAHs in site soils are less than 1×10^{-6}. Therefore, risks from exposure to PAHs, including benzo(a)pyrene, are not significant and do not require further action.

   The results of the risk calculations, along with assumptions and calculation inputs provided as Attachment A to this letter, will be appended to the final Construction Completion Report (CCR). In addition, the following text will be inserted into Section 3.1.3 and 4.0 of the final CCR to provide reference to the calculations and

findings, as follows: "A TACO Tier 3 risk calculation was performed to evaluate the potential significance of this exceedance. Results are presented in Appendix F and indicate risks from exposure to PAHs (including benzo(a)pyrene) in site soils are not significant.".

2. **IEPA Comment #7**. The Illinois EPA was unable to locate the work plan figures (Figures 2 and 3A) the Army refers to in their response. In addition, the floor and wall confirmation samples proposed in Figure 2-3A (attached) of the work plan contradict the Army's claim the wall samples were collected at the locations and depths specified. In fact, as shown in Figure 4 of the Construction Completion Report, two of the excavation walls received no confirmatory sampling at all. It is apparent the Army disregarded Figure 2-3A of the work plan, choosing instead to locate samples as shown in Figure 2-3. However, the Illinois EPA provided Figure 2-3A as a replacement figure to clarify sample locations shown in Figure 2-3. Obviously, the Army committed to utilizing Figure 2-3A since it was part of the final work plan. But, upon completion of the sampling, nothing even faintly resembling Figure 2-3A was received. Please explain.

Response: It was the full intent of the Army and its agent to perform the sampling consistent with the approved Work Plan. In response to this comment, review of the Army's letter and attachments dated April 2, 2002 indicates that both Figures 2-3 and 2-3A were submitted for inclusion into the final Work Plan (copy provided as Attachment B). Figure 2-3A was added at the request of the IEPA with the Army's understanding to provide further clarification of the planned sample locations, not to serve as a replacement figure as suggested. It is also noted that no inconsistencies in the planned sample locations at the Former Wash Rack site were apparent to the Army, its contractor, or IEPA personnel at the time of approval of the Work Plan or during subsequent implementation of the planned fieldwork.

Notwithstanding this noted inconsistency and the apparent misunderstanding regarding the use of Figure 2-3A, the Army maintains that it fulfilled the intent of the sampling by collecting soil samples at a frequency and locations appropriate to assess the possible presence of contamination at the site, as follows:

- A total of four sidewall samples were collected, the frequency specified in Section 3.3 of the final Work Plan.
- Each of the samples was collected from the midpoint of the wall, halfway between the ground surface and bottom of the excavation (as shown on Figure 2-3A of the final Work Plan).

- Sample locations were roughly evenly distributed around the perimeter of the excavation, in the absence of any field indications of the presence of contamination.
- A total of three floor samples were collected, two from the main excavation and one from the gravel area further to the south, at the frequency specified in Section 3.3 of the final Work Plan.

On this basis, it is the Army's position that the completed sampling is adequate to assess the possible presence of contamination at the site and that the results obtained are representative of site conditions.

3. **IEPA Comment #12**. The Army's response indicates the concentrations are well within the regional background concentration range of 5,000 to 80,000 mg/kg as published by Illinois EPA in the *Technical Report, A Summary of Background Conditions for Inorganics in Soil, August 1994*. Please be advised, the Army is misquoting the document. In Table 2 of the document, a listing of the inorganic parameters is provided, including iron. For iron, a total of 105 data points were utilized from across the entire state, and the range of values from those 105 data points was 5,000 to 80,000 mg/kg. This means the lowest concentration of the inorganic parameter, iron that went into the data set was 5,000 mg/kg, and the highest concentration of iron that went into the data set was to 80,000 mg/kg. In Table G of Appendix A found in Title 35 of the Illinois Administrative Code ("35 IAC") Part 742 "Tiered Approach to Corrective Action Objectives" ("TACO"), a concentration of 15,900 mg/kg is provided as the soil background concentration of iron for counties within the Metropolitan Statistical Areas ("MSA"). This concentration is the highest background concentration of iron in soils for counties within the MSA. The Army will need to revise their argument in support of the elevated concentrations of iron in the soils at this facility.

Response: To further support the Army's position that no further action is required to address iron in site soils, a calculation was performed to compare site-specific iron data to the U.S Food and Drug Administration (FDA) recommended daily allowance (RDA). The RDA is a recommended dose necessary to maintain good health. This approach was utilized since iron is considered to be an essential nutrient and given the absence of chemical specific toxicity information necessary to perform a risk calculation. The RDA calculation was performed in accordance with U.S. Army Corps of Engineers (USACE) (1995) *Environmental Quality Risk Assessment Handbook*. Detailed description of procedure and calculations are included in Attachment C of this response. The maximum concentration of iron detected in site

soil was used to calculate the estimated daily intake of iron from incidental ingestion. Results indicate that the estimated daily intake is 6 mg/kg, well below the RDA of 10 mg/kg. Therefore, iron concentrations in site soils are not expected to represent a hazard to human health and no further investigations or remedial actions are warranted.

The results of the calculations, along with assumptions and calculation inputs provided as Attachment C to this letter, will be appended to the final Construction Completion Report (CCR). Text will be inserted into Sections 3.1.1, 3.1.2, 3.1.3, and 4.0 to list the exceedances of the provisional remediation objective for iron. Text will also be added to provide reference to the risk calculation and findings, as follows: "A risk calculation was performed to evaluate the potential significance of this iron exceedance. Results are presented in Appendix E and indicate iron concentrations in site soils are not expected to represent a hazard to human health."

Attachment A

RISK EVALUATION OF BENZO(A)PYRENE IN SOIL
FT DEARBORN USARC, CHICAGO, ILLINOIS

Background

During sampling activities at the Ft Dearborn USARC, Chicago, Illinois in September 2002, twenty-four soil samples were collected for laboratory analysis: Benzo(a)pyrene (167 μg/kg) marginally exceeded the residential criterion (90 μg/kg) in one sample at the Former Vehicle Wash Rack (OTH-3).

The presence of benzo(a)pyrene in the environment is ubiquitous since it is a product of incomplete combustion. Additionally, benzo(a)pyrene concentrations at the Ft Dearborn USARC are well below the City of Chicago background concentration (1,302 μg/kg) published in a study entitled *Polynuclear Aromatic Hydrocarbons Background Study, City of Chicago, Illinois* dated February 24, 2003. The IEPA at its website www.epa.state.il.us/land/site-remediation/urban-area-pah-study.pdf recognizes the widespread occurrence of PAHs in the environment and especially in urban areas. In referring to the City of Chicago study, the website states: "Illinois EPA finds these reports to be appropriately conducted studies yielding scientifically valid data regarding background levels of PAHs in Illinois urban surface soils." Moreover, the Illinois EPA finds that the City of Chicago study may be used by the regulated community in site decision making. Given the isolated and marginal exceedence of the TACO residential criterion and the results of the City of Chicago background study, the benzo(a)pyrene exceedance may not be site related.

A Tier 3 risk evaluation was conducted in accordance with Title 35 Illinois Administration Code (IAC) Part 742, Tiered Approach to Corrective Action Objectives (TACO) and USEPA (1989) guidance to assess whether the exceedance of residential criteria for benzo(a)pyrene in site soil poses an issue for property transfer. The approach, assumptions used, and the conclusions from the assessment are described below.

Evaluation

Selected Exposure Areas: The maximum benzo(a)pyrene concentration at location (VWR-002-02-ESW) was selected as the center point. Any sample within a 0.5 acre area was included in the exposure point concentration calculation. The sample data includes all samples collected in OTH-1 (Former Vehicle Inspection Pit), OTH-2 (Former Shop Sink) and OTH-3 (Former Vehicle Wash Rack). The selected sample location and data are presented in Table A-1.

Exposure Pathways and Receptors: Ingestion, dermal contact, and particulate inhalation of PAH contaminated soils were selected as completed and significant exposure pathways for future residents (adult and child). The exposure parameters are presented in Table A-2.

Chemical of Potential Concern (COPCs): Benzo(a)pyrene is the only compound whose maximum concentration (167 µg/kg) exceeds residential soil RO (90 µg/kg). In accordance with IEPA policy, benzo(a)pyrene and all other carcinogenic PAHs were selected as COPCs, although site-specific PAH concentrations of other carcinogenic PAHs were found to be lower than their soil ROs. The other carcinogenic PAHs include: benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene and indeno(1,2,3-c,d)pyrene.

Exposure Point Concentrations (EPCs): EPCs were calculated using procedures described in *Supplemental Guidance to RAGS: Calculating the Concentration Term* (USEPA, 1992). EPCs utilized in the risk assessment were based on the lower of the maximum detected concentration or the 95 percent upper confidence limit (UCL) of the arithmetic mean. Based on U.S. EPA (1989) guidance, the non-detects for a particular PAH were assigned a value of half the reporting limit. The distribution of each combined dataset for each PAH was characterized by using the Shapiro-Wilk W Test (W-Test) (Gilbert, 1987). For normally distributed dataset, normal 95% UCLs were used as EPCs. For lognormally distributed or neither normally nor lognormally distributed datasets,

lognormal 95% UCLs were used as EPCs. EPCs for each PAH is presented in Table A-3. The toxicity value of each PAH is presented in Table A-4.

Quantification of Exposure: Equations used for quantitation of exposure estimates are presented in Table A-5. In accordance with IEPA policy, exposure and risk due to dermal contact with PAHs were not quantitated separately, but were assumed to be same as those from exposure due to soil ingestion.

Risk Calculations: Risk calculation spreadsheets are presented in Tables A-6 to A-8.

Risk Summary: Risk results are presented in Table A-9.

Discussion

The carcinogenic risk for an adult resident due to exposure to PAHs (including benzo(a)pyrene) in site soil was estimated to be 2×10^{-7}, while the cancer risk for a child resident was calculated as 8×10^{-7}. According to the National Oil and Hazardous Substance Pollution Contingency Plan (NCP) (USEPA 1990), potentially acceptable risk levels span the range of one in a million (1×10^{-6}) to one in ten thousand (1×10^{-4}). Cancer risks less than 1×10^{-6} are considered *de minimis* risks, and do not require further attention. The NCP considers 1×10^{-6} as the point of departure in establishing the acceptable level of risk for a site. The estimated carcinogenic risks for adult and child residents are less than 1×10^{-6}. Therefore, risks from exposure to PAHs in site soils, including benzo(a)pyrene, are not significant.

References

Gilbert, R.O. 1987. Statistical Methods for Environmental Pollution Monitoring. Van Nostrand Reinhold.

U. S. Environmental Protection Agency, 1989. Risk Assessment Guidance for Superfund (RAGS): Volume I: Human Health Evaluation Manual (Part A). EPA/540/1-89/002.

U. S. Environmental Protection Agency, 1992. Dermal Exposure Assessment: Principles and Applications. EPA/600/8-91/011B. Washington D.

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Table A-1. Analytical Data for PAH Risk Evaluation
Fort Dearborn U.S. Army Reserve Center
Various Sites Remediations

	Former Vehicle Inspection Pit (OTH-1)				Former Shop Sink (OTH-2)					
Parameter	FIP-001-06-SSS	FIP-002-06-SSS	FIP-003-06-SSS	FIP-004-06-SSS	FSS-001-04-ESW	FSS-002-04-ESW	FSS-003-04-ESW	FSS-004-04-ESW	FSS-005-08-EBT	FSS-006-05-EBT
PAHs (ug/kg)										
Benzo(a)anthracene	12.3 U	12.8 U	12.3 U	12.5 U	12.5 U	12.7 U	11.6 J	9.1 J	12.3 U	32.6
Benzo(a)pyrene	12.3 U	32	12.3 U	10.7 J	12.5 U	12.7 U	10.5 J	6.7 J	12.3 U	28.8
Benzo(b)fluoranthene	12.3 U	12.8 U	12.3 U	12.5 U	12.5 U	12.7 U	11.7 J	7.7 J	12.3 U	28.3
Benzo(k)fluoranthene	12.3 U	12.8 U	12.3 U	12.5 U	12.5 U	12.7 U	7.5 J	6.4 J	12.3 U	24.9
Chrysene	12.3 U	12.8 U	12.3 U	16.3	12.5 U	12.7 U	16.1	12.6	3.8 J	40.6
Dibenz(a,h)anthracene	12.3 U	12.8 U	12.3 U	12.5 U	12.5 U	12.7 U	12.1 U	12.3 U	12.3 U	6.7 J
Indeno(1,2,3-c,d)pyrene	12.3 U	12.8 U	12.3 U	12.5 U	12.5 U	12.7 U	7.7 J	4.3 J	12.3 U	18.4

Table A-1. Analytical Data for PAH Risk Evaluation
Fort Dearborn U.S. Army Reserve Center
Various Sites Remediations

	Former Vehicle Wash Rack (OTH-3)							
Parameter	VWR-001-03-EBT	VWR-001-03-ESW	VWR-002-02-ESW	VWR-003-02-ESW	VWR-004-02-ESW	VWR-005-02-EBT	VWR-006-02-EBT	VWR-007-04-EBT
PAHs (ug/kg)								
Benzo(a)anthracene	5.1 J	4.7 J	138	47.1	10.1 J	9.2 J	26.9	12.3 U
Benzo(a)pyrene	5.4 J	12.2 U	167	58.8	10.3 J	7.5 J	27.7	12.3 U
Benzo(b)fluoranthene	12.5 U	12.2 U	11.5 U	72.4	12.1 U	9.5 J	22	12.3 U
Benzo(k)fluoranthene	12.5 U	12.2 U	11.5 U	39.8	12.1 U	6.2 J	23.5	12.3 U
Chrysene	6.7 J	5.2 J	190	66.1	14	11.3 J	33.6	12.3 U
Dibenz(a,h)anthracene	12.5 U	12.2 U	11.5 U	6 J	12.1 U	11.7 UJ	11.9 U	12.3 U
Indeno(1,2,3-c,d)pyrene	3.6 J	12.2 U	104	44.9	6.1 J	5.9 J	18.3	12.3 U

Table A-1. Analytical Data for PAH Risk Evaluation
Fort Dearborn U.S. Army Reserve Center
Various Sites Remediations

	Oil/Water Separator (OWS-1)					
Parameter	OWS-001-05-ESW	OWS-002-05-ESW	OWS-003-04-ESW	OWS-004-05-ESW	OWS-005-08-EBT	OWS-006-08-EBT
PAHs (ug/kg)						
Benzo(a)anthracene	64.7	21.6	11.4 U	12.2 U	12 U	12.1
Benzo(a)pyrene	69.6	22.9	11.4 U	12.2 U	12 U	11.3 U
Benzo(b)fluoranthene	70	20.8	11.4 U	12.2 U	12 U	11.3 U
Benzo(k)fluoranthene	60.2	24.3	11.4 U	12.2 U	12 U	11.3 U
Chrysene	84.2	27.8	11.4 U	12.2 U	12.2	13.4
Dibenz(a,h)anthracene	12.6 U	12.5 U	11.4 U	12.2 U	12 U	11.3 U
Indeno(1,2,3-c,d)pyrene	46.4	15.6	11.4 U	12.2 U	12 U	11.3 U

Notes:

Bold Analytical result exceeded TACO soil RO for residential ingestion pathway.

Selected data points for human health risk assessment (OTH-1, OTH-2 and OTH-3)

U Analyte was not detected.

J Reported concentration is estimated.

Table A-2. Exposure Parameters
Fort Dearborn U.S. Army Reserve Center
Various Sites Remediations

Parameter	Units	Residents	
		Adult	Child
General			
Exposure Frequency (EF)	days/year	350	350
Exposure Duration (ED)	years	24	6
Body Weight (BW)	kg	70	15
Averaging Time-noncarcinogenic effects (AT-n)[a]	days	8760	2190
Averaging Time-carcinogenic effects (AT-c)[a]	days	25550	25550
Ingestion of Soil			
Ingestion Rate (IRs)[b]	mg soil/day	50	200
Fraction Ingested[c]	unitless	1	1
Conversion Factor (CF)	kg/µg	1.0E-09	1.0E-09
Inhalation of Particulate in Soil			
Inhalation Rate (InhR)[d]	m^3/day	20	20
Particulate Emission Factor (PEF)	m^3/kg	1.24E+09	1.24E+09
Conversion Factor (CF)	mg/µg	1.0E-03	1.0E-03

Unless otherwise noted, parameter values are from Illinois Administrative Code Title 35, Part 742, Tiered Approach to Corrective Action Objectives.

(a) Noncarcinogenic: ED x 365 days/year; Carcinogenic: 70 years x 365 days/year

(b) USEPA, Exposure Factors Handbook (1997), Table 4-23. Use 200 mg soil/day as a conservative value for child.

(c) Assumed based on activity pattern and time spent on-site

(d) USEPA, 1989. Risk Assessment Guidance for Superfund Volume 1, Part A.

Table A-3. Exposure Point Concentrations (EPCs)
Fort Dearborn U.S. Army Reserve Center
Various Sites Remediations

Analyte Name	Units	Maximum Conc.	Minimum Conc.	Average Conc.	Number of Samples	Number of Non-Detects	Detection Frequency	Normal	LogNormal	UCL	lnUCL	EPC
Benzo(a)anthracene	µg/kg	138	<12.3	19.13	18	8	56	No	No	32.14	28.53	28.53
Benzo(a)pyrene	µg/kg	167	<12.2	22.71	18	7	61	No	No	38.51	36.30	36.30
Benzo(b)fluoranthene	µg/kg	72.4	<11.5	12.53	18	12	33	No	No	19.14	16.56	16.56
Benzo(k)fluoranthene	µg/kg	39.8	<11.5	10.13	18	12	33	No	No	13.97	13.06	13.06
Chrysene	µg/kg	190	<12.3	25.21	18	6	67	No	No	43.25	42.87	42.87
Dibenz(a,h)Anthracene	µg/kg	6.7	<11.5	6.15	18	16	11	Yes	Yes	6.24	6.24	6.24
Indeno(1,2,3-cd)pyrene	µg/kg	104	<12.2	14.95	18	9	50	No	No	24.86	21.09	21.09

UCL = Upper Confidence Interval
EPC = Exposure Point Concentration

Table A-4. Toxicity Values For Chemicals of Potential Concern
Fort Dearborn U.S. Army Reserve Center
Various Sites Remediations

	Cancer Effects						
	Oral SF (mg/kg-day)-1		Dermal SF (a) (mg/kg-day)-1	Inhalation URF ($\mu g/m^3$)-1		Inhalation SF (b) (mg/kg-day)-1	EPA Weight of Evidence Classification
Semivolatile Organic Compounds							
Benzo(a)anthracene	7.3E-01	E	7.3E-01	8.9E-05	E	3.1E-01	B2
Benzo(a)pyrene	7.3E+00	I	7.3E+00	8.9E-04	E	3.1E+00	B2
Benzo(b)fluoranthene	7.3E-01	E	7.3E-01	8.9E-05	E	3.1E-01	B2
Benzo(k)fluoranthene	7.3E-02	E	7.3E-02	8.9E-06	E	3.1E-02	B2
Chrysene	7.3E-03	E	7.3E-03	8.9E-07	E	3.1E-03	B2
Dibenz(a,h)anthracene	7.3E+00	E	7.3E+00	8.9E-04	E	3.1E+00	B2
Indeno(1,2,3-c,d)pyrene	7.3E-01	E	7.3E-01	8.9E-05	E	3.1E-01	B2

SF Slope Factor
URF Unit Risk Factor
a Dermal slope factor (SF) = Oral CSF/Oral Absorption if the oral absorption efficiency was less than 50 percent
b SF $(mg/kg\text{-}day)^{-1}$ = Unit Risk Factor (URF) $(ug/m^3)^{-1}$*70kg*1000(ug/mg)/20(m^3/day)
B2 Probable human carcinogen based on sufficient information in animals
E Provisional inhalation toxicity values have been developed by the National Center for Environmental Assessment (NCEA). RAGS: Region 4 Bulletins, Human Health Risk Assessment (Interim Guidance) (November 1995).
I Integrated Risk Information System (IRIS) database, searched July 2003

Table A-5. Equations Used for Quantitation of Exposure Estimates
Fort Dearborn U.S. Army Reserve Center
Various Sites Remediations

Incidental Ingestion of Soil:

$$LADD(mg/kg-day) = \frac{CS \times IngR \times CF \times EF \times ED}{BW \times AT_c}$$

where:

CS	=	Contaminant concentration in soil (mg/kg)
IngR	=	Soil ingestion rate (mg soil/day)
CF	=	Conversion factor (10^{-6} kg/mg)
EF	=	Exposure frequency (days/year)
ED	=	Exposure duration (years)
BW	=	Body weight (kg)
ATc	=	Averaging time for carcinogenic effects: 70 years x 365 days/yr
LADD	=	Lifetime average daily dose

Inhalation of Fugitive Dust:

$$LADD(mg/kg-day) = \frac{CA \times InhR \times EF \times ED}{BW \times AT_c \times PEF}$$

where:

CA	=	Contaminant concentration in air (mg/m^3)
InhR	=	Inhalation rate (m^3/day)
EF	=	Exposure frequency (days/year)
ED	=	Exposure duration (years)
PEF	=	Particulate emission factor (m^3/kg)
BW	=	Body weight (kg)
AT_c	=	Averaging time for carcinogenic effects: 70 years x 365 days/yr
LADD	=	Lifetime average daily dose

Carcinogenic Risk

$$ELCR = LADD \times SF$$

Where:

ELCR	=	Excess Lifetime Cancer Risk
SF	=	Cancer Slope Factor or Slope Factor $(mg/kg\text{-}day)^{-1}$
LADD	=	Lifetime average daily dose

Table A-5. Equations Used for Quantitation of Exposure Estimates
Fort Dearborn U.S. Army Reserve Center
Various Sites Remediations

General Note:

1. The equations presented were used to calculate chemical intakes or absorbed doses and carcinogenic risks for the pathway and route of exposure indicated. Refer to Table A-2 and Table A-4 for the exposure factors (e.g., EF, BW, etc.) and toxicity factors (SF), respectively, used in conjunction with these equations to quantitate exposure estimates and carcinogenic risks.

2. In accordance with IEPA guidance, exposure and risks due to dermal contact with PAHs were not quantitated separately, but were assumed to be same as those from exposure due to soil ingestion

Table A-6. Toxicity Factors and EPCs for Chemicals of Potential Concern
Fort Dearborn U.S. Army Reserve Center
Various Sites Remediations

Carcinogenic Risk				
COPC	Ingestion Slope Factor	EPC for Soil	Inhalation Slope Factor	Volatile Inhalation Risk Factor
	(kg-day/mg)	(µg/kg)	(kg-day/mg)	(m^3/µg)
Benzo(a)anthracene	7.30E-01	28.53	3.10E-01	8.86E-05
Benzo(a)pyrene	7.30E+00	36.30	3.10E+00	8.86E-04
Benzo(b)fluoranthene	7.30E-01	16.56	3.10E-01	8.86E-05
Benzo(k)fluoranthene	7.30E-02	13.06	3.10E-02	8.86E-06
Chrysene	7.30E-03	42.87	3.10E-03	8.86E-07
Dibenz(a,h)anthracene	7.30E+00	6.24	3.10E+00	8.86E-04
Indeno(1,2,3-c,d)pyrene	7.30E-01	21.09	3.10E-01	8.86E-05

Table A-7. Soil Ingestion Exposure Evaluation
Fort Dearborn U.S. Army Reserve Center
Various Sites Remediations

	Carcinogenic Risk			
	Adult Resident		Child Resident	
COPC	LADD	ELCR	LADD	ELCR
Benzo(a)anthracene	6.70E-09	4.89E-09	3.13E-08	2.28E-08
Benzo(a)pyrene	8.52E-09	6.22E-08	3.98E-08	2.90E-07
Benzo(b)fluoranthene	3.89E-09	2.84E-09	1.81E-08	1.32E-08
Benzo(k)fluoranthene	3.07E-09	2.24E-10	1.43E-08	1.04E-09
Chrysene	1.01E-08	7.35E-11	4.70E-08	3.43E-10
Dibenz(a,h)anthracene	1.46E-09	1.07E-08	6.84E-09	4.99E-08
Indeno(1,2,3-c,d)pyrene	4.95E-09	3.62E-09	2.31E-08	1.69E-08
	Summary			
	Adult Resident		Child Resident	
ELCR	8.46E-08		3.95E-07	

Table A-8. Particulate Exposure Evaluation
Fort Dearborn U.S. Army Reserve Center
Various Sites Remediations

	Carcinogenic Risk			
	Adult Resident		Child Resident	
COPC	LADD	ELCR	LADD	ELCR
Benzo(a)anthracene	2.16E-12	6.70E-13	2.52E-12	7.82E-13
Benzo(a)pyrene	2.75E-12	8.52E-12	3.21E-12	9.95E-12
Benzo(b)fluoranthene	1.25E-12	3.89E-13	1.46E-12	4.54E-13
Benzo(k)fluoranthene	9.89E-13	3.07E-14	1.15E-12	3.58E-14
Chrysene	3.25E-12	1.01E-14	3.79E-12	1.17E-14
Dibenz(a,h)anthracene	4.72E-13	1.46E-12	5.51E-13	1.71E-12
Indeno(1,2,3-c,d)pyrene	1.60E-12	4.95E-13	1.86E-12	5.78E-13

	Summary	
	Adult Resident	Child Resident
ELCR	1.16E-11	1.35E-11

Table A-9. Summary of Human Risk Assessment for Soil

Fort Dearborn U.S. Army Reserve Center
Various Sites Remediations

	Adult Resident	Child Resident
Total ELCR	2E-07	8E-07

ELCR = Excess Lifetime Cancer Risk

Attachment B

DEPARTMENT OF THE ARMY
HEADQUARTERS, 88TH REGIONAL SUPPORT COMMAND
506 ROEDER CIRCLE
FORT SNELLING, MINNESOTA 55111-4009

REPLY TO
ATTENTION OF

APR 0 2 2002

Deputy Chief of Staff, Engineer

Subject: Submittal of the final Work Plan and Field Sampling Plan Change Pages for the Fort Dearborn U. S. Army Reserve Center, Chicago, IL BRAC Closure.

Andrew J. Jankowski, Project Manager
Illinois Environmental Protection Agency
1021 North Grand Avenue East
P.O. Box 19276
Springfield, IL 62794-9276

Dear Mr. Jankowski:

This letter is in response to your March 14, 2002 letter. We agree to the modification that you requested for figure 2-3. The attached are the proposed changes required to implement the modification.

Please direct your comments or requests for further information to Mr. Mark Buck, Environmental Division Chief, telephone (612) 713-3826.

Sincerely,

Mark E Buck

Mark E. Buck, PE
BRAC Environmental Coordinator

Enclosures

FIELD SAMPLING PLAN
REPLACEMENT PAGES

LIST OF FIGURES

slurry and will be placed to within 2-feet of the ground surface. A concrete plug will be installed at the surface of each boring location.

Excavation Sampling

Following excavation and equipment removal operations, soil samples from the excavations at the former shop sink (OTH-2), the oil/water separator (OWS-1), and the vehicle wash rack (OTH-3) will be collected using surface soil sampling methods. Specific sampling locations, quantities and types are provided in Figures 2-3, 2-3A, 2-4, 2-5, 2-6 and 2-7. Sampling equipment will be decontaminated prior to sampling and between each sampling location in accordance with Section 2.2 of this Field Sampling Plan. Sample collection procedures are detailed in Section 3.2 of this Field Sampling Plan.

2.2 DECONTAMINATION ACTIVITIES

All equipment that may directly or indirectly contact samples shall be decontaminated prior to use. This includes hand augers, sampling devices, and instruments such a borehole depth sounders. In addition, care shall be taken to prevent samples and sampling equipment from coming into contact with potentially contaminating substances such as fugitive dust, tape, oil, engine exhaust, corroded surfaces, dirt, or any airborne source of contamination. A temporary decontamination station shall be set up at the site to contain decontamination water. Decontamination water will be containerized in fully enclosed poly tanks or if the quantities warrant it in frac tanks.

Field Equipment Decontamination

The following procedures shall be used to decontaminate all large pieces of equipment, such as backhoe buckets:

1. External surfaces of equipment shall be washed with high-pressure hot water and Alconox™. In some cases, more vigorous decontamination procedures, such as scrubbing, shall be required if visible material remains on the equipment after high-pressure washing.

2. Equipment shall be thoroughly rinsed with potable water.

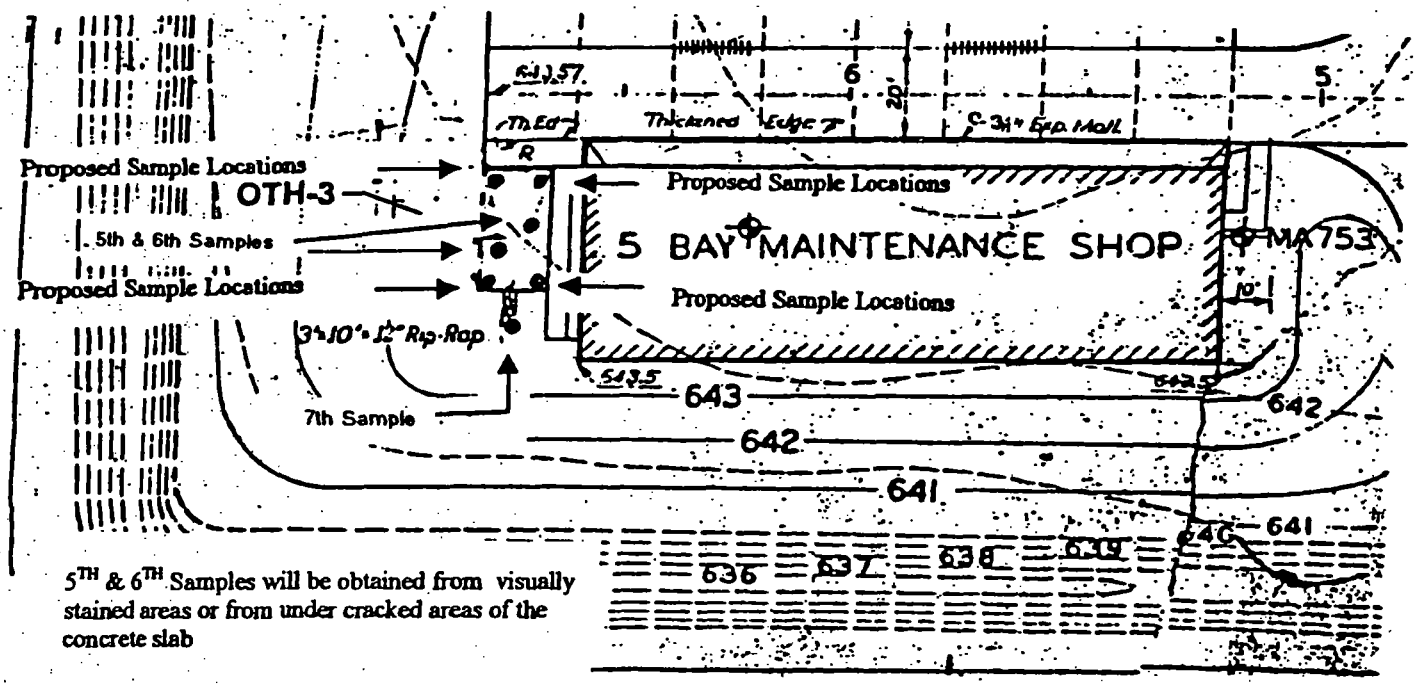
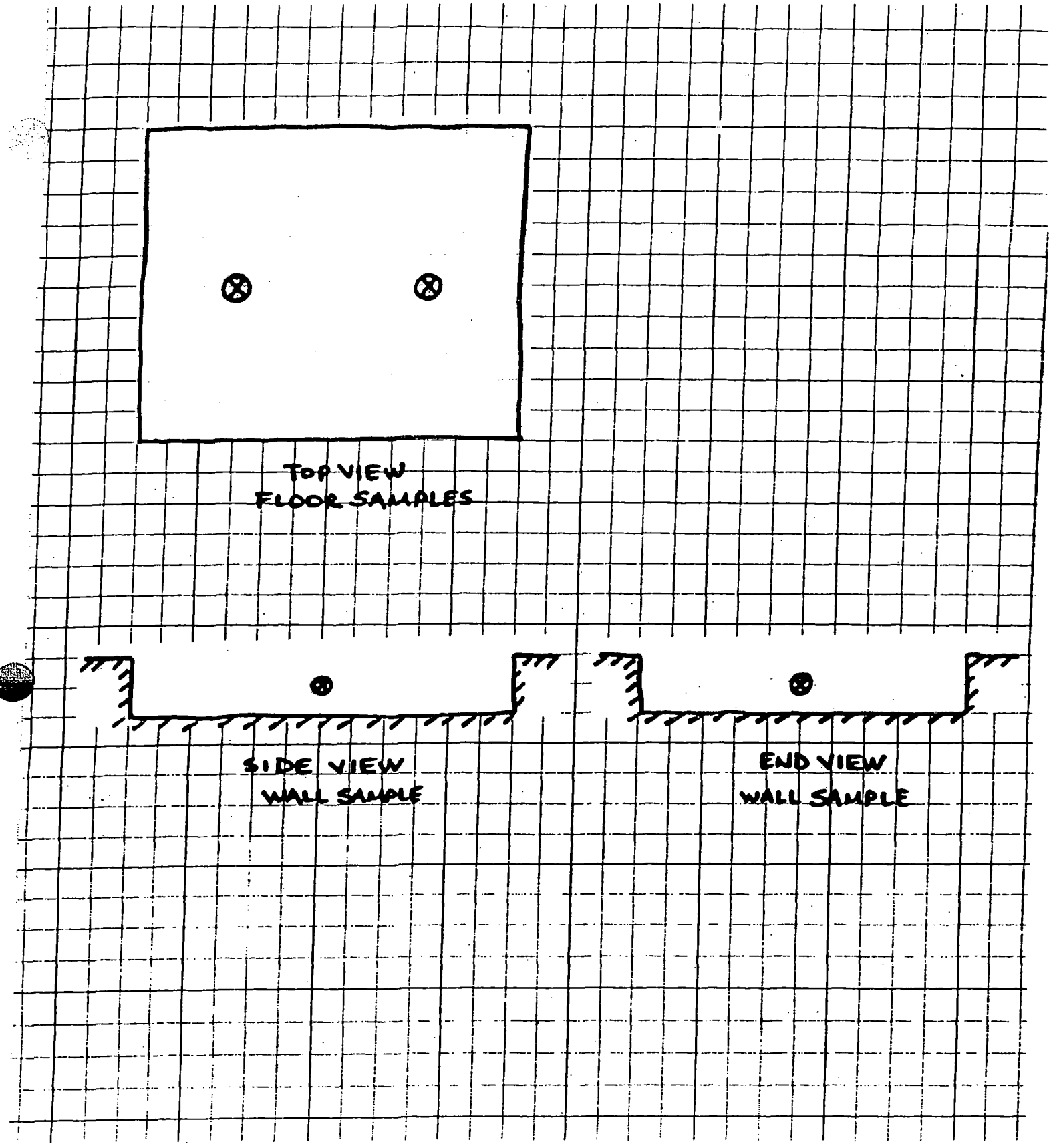


Figure 2-3
OTH-3 – Former Vehicle Wash Rack

FERGUSON·HARBOUR



NOT TO SCALE

Figure 2-3A
OTH-3 – Former Vehicle Wash Rack
Field Sampling Plan
Proposed Sample Depth Locations

FERGUSON·HARBOUR

WORK PLAN REPLACEMENT PAGES

identifying possible contamination. This objective will be accomplished by performing the following sequence of activities:

- Remove concrete wash rack.
- Excavate and stage potentially contaminated soil.
- Sample excavation area for closure samples.
- Sample staged material for disposal profiling and dispose of excavated materials.
- Backfill excavation with crushed stone and compact.

FHI will utilize a backhoe or small excavator to remove the concrete wash rack. Once the concrete has been removed, FHI will excavate any soil determined to be potentially contaminated based on screening with a PID or through visual observation. Handling and disposal of excavated materials will be performed in accordance with applicable laws and regulations, as described in Section 4.0 of this Work Plan.

Once any suspected contaminated soil is removed, confirmation soil samples will be collected for laboratory chemical analysis. Soil samples will be collected based on the area of the excavation following the procedures outlined in the MDEQ Waste Management Division Verification of Soil Remediation Guidance Document of April 1994, Revision 1. It is currently estimated that six soil samples will be required for laboratory chemical analysis. Samples will be collected in accordance with the procedures specified in the Field Sampling Plan, submitted along with the Work Plan.

Soil samples will be collected from the excavation at locations where the PID readings were the highest or in visually stained areas. If no PID readings above background are found and visually stained areas do not exist, samples will be collected at the locations beneath the wash rack as shown on Figures 2-3 and 2-3A of the Field Sampling Plan. Additionally, one soil sample will be obtained from the riprap area south of the wash rack. Each sample will be sent to ARDL and analyzed for VOCs, SVOCs, PNAs, TAL metals, glycol and PCBs. Analytical parameters are based on contaminants generally associated with vehicle and equipment maintenance operations and were agreed upon during a BCT conference call on January 4, 2001.

Once the sampling locations have been noted in a logbook, the excavation will be backfilled with crushed stone from a USACE tested source and compacted in 1-foot lifts.

Attachment C

RISK EVALUATION OF IRON IN SOIL
FT DEARBORN USARC, CHICAGO, ILLINOIS

Background

During sampling activities at the Ft Dearborn USARC, Chicago, Illinois in September 2002, iron in site soils exceeded the IEPA (2003) provisional residential ingestion criterion of 23,000 mg/kg in 5 of 24 soil samples analyzed at concentrations ranging from 23,900 to 31,600 mg/kg. Exceedances of the iron provisional objective were detected sporadically at the former vehicle inspection pit (OTH-1), former shop sink (OTH-2), and former vehicle washrack (OTH-3). Provided below is an evaluation of the potential human health risks due to iron in site soils. The approach, assumptions used, and the conclusions from the assessment are described below.

Evaluation

Iron is an essential nutrient for all receptors and generally does not present a hazard to human health. On the contrary, iron is essential for good health and is routinely taken as dietary supplement. Information regarding adverse health impacts due to exposure to iron is limited to inhalation of iron oxide and handling of iron ore, where iron concentrations are significantly higher than those detected at this site.

Iron is evaluated as a separate constituent from other contaminants because it is an essential nutrient and a dose that is a substantial fraction of a toxic dose can be safe and even necessary for good health. Information used to determine whether or not iron concentrations measured in site soils requires further action has been taken from the *Environmental Quality Risk Assessment Handbook* (USACE, 1995) and *Recommended Dietary Allowances* (NRC, 1989).

To conservatively evaluate the potential human health effects due to iron in site soils, the following equation from USACE (1995) was used to calculate a child's daily intake of iron from incidental ingestion of site soil:

Estimated Daily Intake (mg/day) = $CS \times CF \times IR$

where:

CS = Maximum concentration of the metal in soil (31, 600 mg/kg)

CF = Conversion factor (1×10^{-6} kg per mg soil)

IR = Child Ingestion rate (200 mg soil per day; default value from USEPA, 1997)

The maximum concentration of iron detected in site soils is 31,600 mg/kg. Using the equation presented above, ingestion of 200 mg of soil per day with this concentration of iron would result in an intake of about 6 mg/day by children. This calculated iron intake is well below the U.S. Food and Drug Administration (FDA) recommended daily allowance (RDA) of 10 mg/day for children (USACE, 1995) to maintain good health.

By comparison, the intake for an adult residing at the site will be 1.5 mg/day (based on an ingestion rate of 50 mg/day of soil) (USEPA, 1997) and the RDA is 10 to 12 mg/day (USACE, 1995). Therefore, adult intake of iron would be a smaller percentage of the RDA than that calculated for a child.

On this basis, iron concentrations in site soils are not expected to represent a hazard to human health.

Discussion

Given the sporadic nature of the iron exceedances, the fact that iron is an essential nutrient, and concentrations in site soils are not known or expected to represent a hazard to human health, no further investigations or remedial actions are warranted due to iron in site soils.

References

Illinois Environmental Protection Agency. 2003. Internal Technical Memorandum from Tom Hornshaw to Andy Jankowski. August 8.

National Research Council (NRC), 1989. Recommended Dietary Allowance: National Academies Press (NAP), 10th Edition. Washington, D. C.

United States Army Corps of Engineers (USACE), 1995. Environmental Quality Risk Assessment Handbook, Volume I: Human Health Evaluation. EM 200-1-4.

U.S. Environmental Protection Agency, 1997. Exposure Factor Handbook.

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